Soundbook™

User's Manual
Acoustic Measuring System Soundbook MK2

Version: MK2
June 20, 2013
© SINUS Messtechnik GmbH
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http://www.soundbook.de/e

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Preface

Thank you for choosing the product Soundbook ™ by SINUS Messtechnik GmbH. Please read this manual carefully before using the measuring system. We recommend you to perform several test measurements to get familiar with the instrument before using it for important measuring tasks. The manual includes the following signs to indicate important information:

NOTICE!	These are information on the efficient use and correct handling of the analyzer as well as additional information.

CAUTION!	These instructions shall avoid any hardware damages or dangers for users.

ATTENTION!	These instructions shall avoid any measurement mistakes, hardware damages etc.

Please feel free to contact us for any questions on the functionality and operation of the instrument. Direct your questions or catalogue requests as well as requests on spare parts and accessories to the following address:

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SMT™	SINUS Messtechnik GmbH
APOLLO™	SINUS Messtechnik GmbH
SAMURAI™	SINUS Messtechnik GmbH
μREMUS™	Caesar Datensysteme GmbH

1 Introduction

Soundbook is a universal portable measuring system for acoustic and vibration measurements as well as general engineering applications. It is based on the hardware and software of the APOLLO™ from SINUS Messtechnik GmbH and the field-capable portable PC Toughbook™ CF-19 from Panasonic. Due to its robust dust-protected and spill-resistant design combined with a magnesium alloy case the compact system is highly versatile. Soundbook is an open platform with Windows operating system. The realtime signal processing unit is an APOLLO analyzer combined with the CF-19 in one device. The independently working analyzer subsystem is operated by the PC using the software device driver.

The various software applications (siNoise™, SAMURAI™, μREMUS™ and SMT) utilize the realtime signal processing unit as automatically controlled instrument. The device architecture provides the user with a versatile programmable instrument simultaneously including a computer as a tool which has become almost indispensable today. General office applications, internet access, remote control, printer control, network capability etc. are provided by the PC.

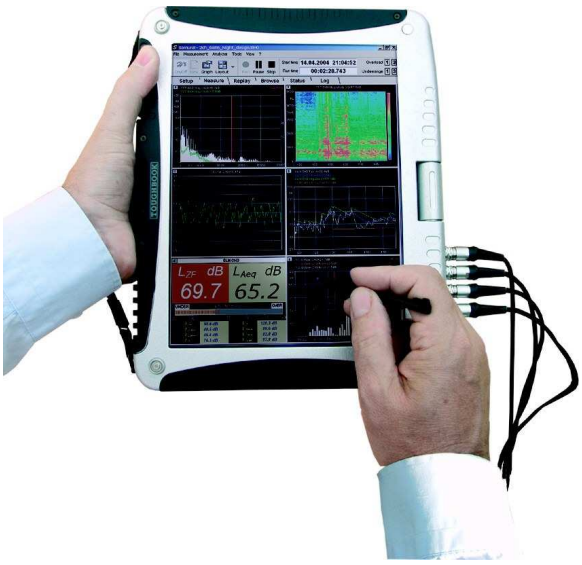

Figure 1.1: Operation as PEN-PC

Figure 1.2: Operation as notebook

Soundbook version	LEMO	BNC
Order No.	908002	908006
Input sockets	LEMO7	BNC
Transducer power supply*	±14 V; Polarization (20 V, 63 V, 200V); ICP (2 mA, 4 mA)	ICP (2 mA, 4 mA)
Sampling frequencies*	200 Hz - 204,8 kHz	

Table 1.1: Soundbook versions

* switchable for each channel

The large and very bright TFT display in XGA format safeguards an excellent representation of the measurement results and may also be used as input device due to its touchscreen functionality. It is even convertible. So it allows you to either use the Soundbook traditionally as a notebook or as PEN PC (similar to an electronic notepad). You do not need an office or a table for easily handling the Soundbook. The powerful lithium-ion battery and the modern circuit design ensure battery operation for about four hours including the power supply of the microphones, the accelerometers or similar transducers. The operating system constantly monitors the state of the battery. If the battery charge drops below 20 % while you are using

SAMURAI or siNoise as measuring software, a warning message will be displayed. In this case connect the included power supply to the device. If the battery charge drops below 10 %, the current measurement is stopped since the accuracy may no longer be safeguarded. The operating system is set to go to standby as soon as the battery charge drops below 10 %. This is very important to avoid major damages to the device. Due to its optimized power consumption scheme Soundbook does not require a fan.

You may easily exchange the battery and the hard disk by yourself without any tools. A small cable power supply unit for 100 . . . 230 VAC at 50 . . . 60 Hz as well as a practical carrying strap complete the scope of delivery. On your request and without additional charges we may also supply Soundbook with an American keyboard and a multilingual Windows operating system. We may also include the following chargeable options on your request:

- Additional RAM (max. 4 GBytes)
- Soundbook carrying case made of highly durable plastic with protection class IP68
- Integrated GPRS modem for wireless communication within mobile telephone networks
- External charger and additional lithium-ion batteries
- Backlit keyboard
- DC power adapter for 11 . . . 32 VDC

Combined with the SAMURAI or siNoise software packages as well as appropriate measuring microphones Soundbook is a sound level meter complying with IEC 61672. Technical specifications are provided in table 3.1.

1.1 Safety instructions

Please follow the instructions below when using the device :

- Use the device as described in this manual only.
- Despite the robust design and protection class IP54 protect the device from mechanical impacts and vibrations and keep it dry and clean.
- When using microphones please pay attention to the sensitive microphone membranes and avoid touching or moistening them.
- Do not feed the in- or outputs with voltages other than specified in this manual.
- Use only microphones which are intended for use with the device. Please feel free to contact us in any case of doubt.
- Please note the permissible ambient temperatures specified for the device. At lower temperatures the device will not unlock unless the electrical heating has heated up the hard disk to more than +5 °C. The heating-up of the hard disk is indicated by the charge LED flashing orange and green alternately.
- Always switch off the device after using. When storing the device for several days we recommend you to remove the batteries, otherwise the Wake-On-LAN feature of the Toughbook will exhaust the battery (approx. 6 % of the capacity each 24 h).
- Do not expose the device to extreme heat as for example in a car under direct sunlight.
- Operate the device on battery whenever possible to discharge and charge the battery regularly. Despite the integrated lithium-ion battery showing no memory effects this will extent the battery life considerably compared to buffer battery operation.
- If necessary, clean the device carefully without using solvents. Carefully wipe the display with the included cleaning cloth only.
- If a malfunction occurs, do not attempt to disassemble or repair the device. This will always cause a loss of warranty and often lead to major damages. Please take down any failures and return the device together with a description of the failure.
- Use only the included power supply unit and if necessary, the optional adjustable DC power supply adapter for car mains supply or similar DC supplies.
- Please also follow the operating instructions of the Toughbook CF-19.
- Use only the included stylus, which is attached to the display, to touch the screen. Thus, you may preserve the high quality of the display permanently. For use in very rigorous environments special exchangeable protective films are available.
- If service is required, always return the device to SINUS Messtechnik GmbH; under no circumstances to Panasonic!

2 Hardware description

The device is either powered from the internal battery or from a mains power outlet using the included **power supply**. It is intended for a nominal voltage of 220-240 V at a mains frequency of 50 Hz (or 100-120 V at 60 Hz, depending on your country). The maximum operating time of the device when powered from battery and under the specified ambient conditions (please refer to table 3.1) is at least 3.5 hours. Please note that you may increase the specified operating time considerably by decreasing the brightness of the display.

2.1 Soundbook sockets

2.1.1 Main Channels

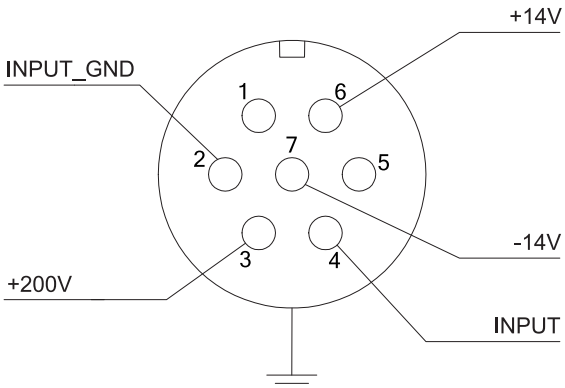

Figure 2.1: Main Channel socket assignment

The main channels offer to connect many different sensor types. Different kinds of voltage- and current supply are supported as well as a maximum bandwith of 80 kHz (table 1.1). Sensors may be calibrated by an external singnal on the main channels. Further details as time- and frequency weighting are given in table 3.1.

2.1.2 Trigger/Tacho

The **TRG** socket serves to monitor a signal and if so to activate a **Trigger** and if configured to send a trigger caused signal out. The trigger outputs are isolated switchable. For this the “TRG_OUT_COM” privides an own electrical mass. The trigger treshold is adjustable between $\pm$ 12.5 V. The trigger outputs may also be used as **Tacho** inputs. In this case a frequency is calculated from the incidence the trigger treshold is overcome. Using the optional Trigger-Splitterbox (figure 2.3) you may split the LEMO socket to individual BNC sockets. If desired the simple **Apollo Tachocable** [908185.7] is available, too.

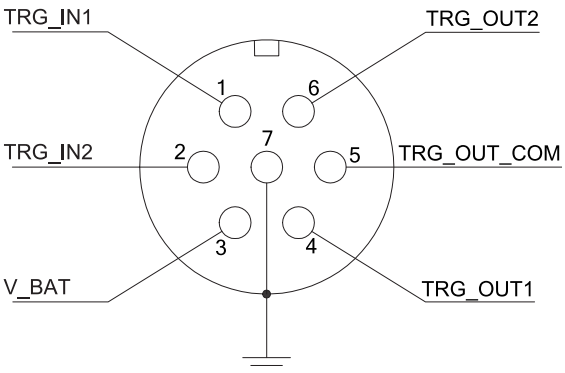

Figure 2.2: TRG socket assignment

Figure 2.3: Apollo Trigger-Splitterbox

2.1.3 Slow Channels

The **SLOW** socket provides 8 slow channels with a fixed sample rate of 200 Hz, that measns a bandwidth of 78.125 Hz. It serves to measure static or slowly changing signals or conditions. These channels optimal to connect sensors for pressure, force, temperature or similar values. With the optional Slow-Channel Splitterbox (figure 2.5) you may split the LEMO socket to individual BNC sockets.

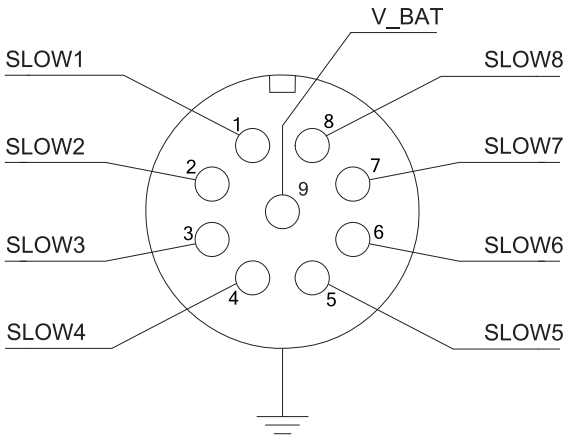

Figure 2.4: SLOW socket assignment

Figure 2.5: Apollo Slow Channel Box

2.1.4 Output

The output channels provide the signals of the internal generator. It is also possible to interconnect signals from the main channels to output. For example these as well as synthesized signals or signals which have been recorded to the hard disk may be given out during a running measurement. Via the Output-Cinch adaptercable [974158.6] you may connect headphones or loudspeakers. Using an additional Cinch-BNC adaptercable [974162.5] you may split the LEMO socket to individual BNC sockets (figure 2.7).

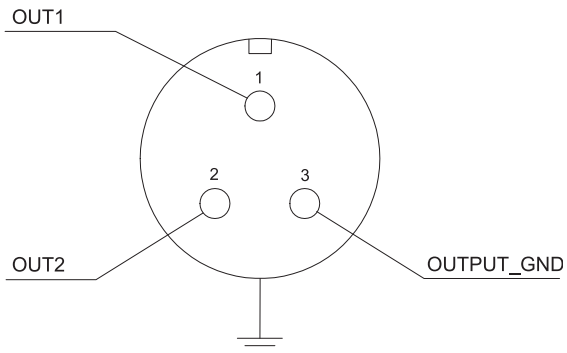

Figure 2.6: OUT 1/2 socket assignment

Figure 2.7: Output adapter cable

2.1.5 POWER/SYNC/GPS

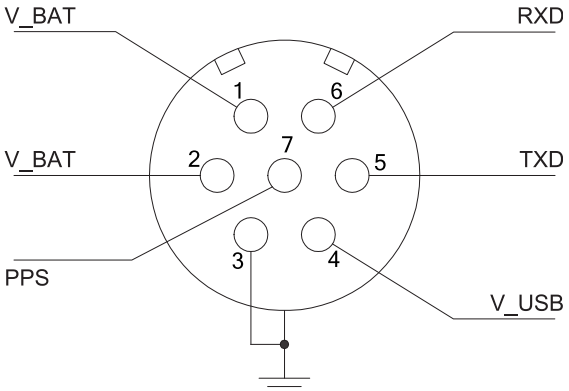

Figure 2.8: POWER/SYNC/GPS socket assignment

The **POWER/SYNC/GPS** socket mainly serves for the synchronisation of several APOLLO analyzers. It is also used to connect a GPS receiver. The "'V_Bat"' Pin provides power only in Soundbook MK2, not in APOLLO-Box or EXPANDER.

2.1.6 AUX

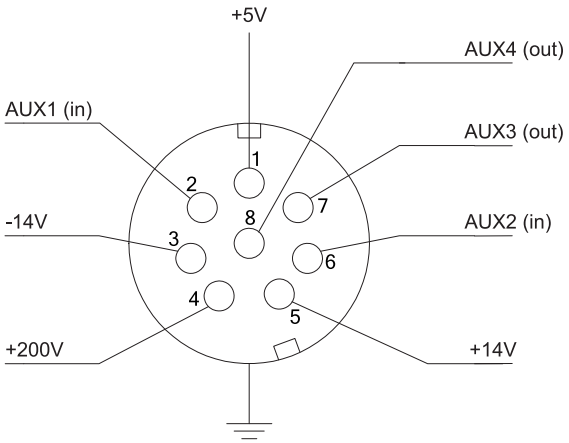

Figure 2.9: AUX socket assignment

The **AUX** socket serves for the connection of external devices like a remote control, a Soundintensity probe etc. The inputs are TTL. The outputs are switchable between 0 V and 3.3 V to drive LEDs for example.

2.2 First use

By default, Soundbook is supplied fully equipped with installed operating system and SINUS device driver. The default password is “soundbook”. Depending on your scope of delivery, Sinus has already installed the application software (siNoise/ SAMURAI/ μREMUS / SMT) and carried out a full system check as well. Any further PC parameters (users, network, Internet) have to be set by you. You may, however, request one of our authorized representatives or distributors to set up your device at your expense. The following figures show the connectors at the front and the back of an 8-channel system.

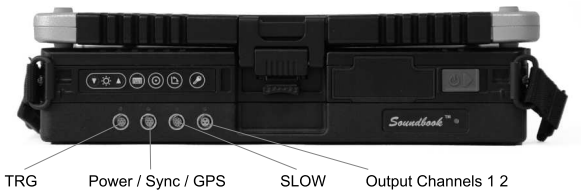

Figure 2.10: Front panel of the Soundbook MK2

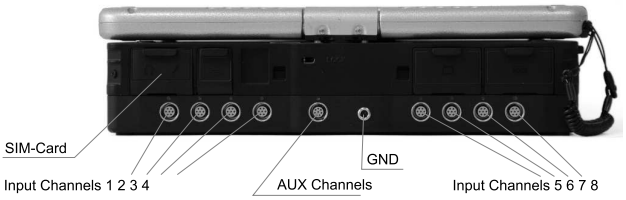

Figure 2.11: Rear panel of the 8-channel LEMO device

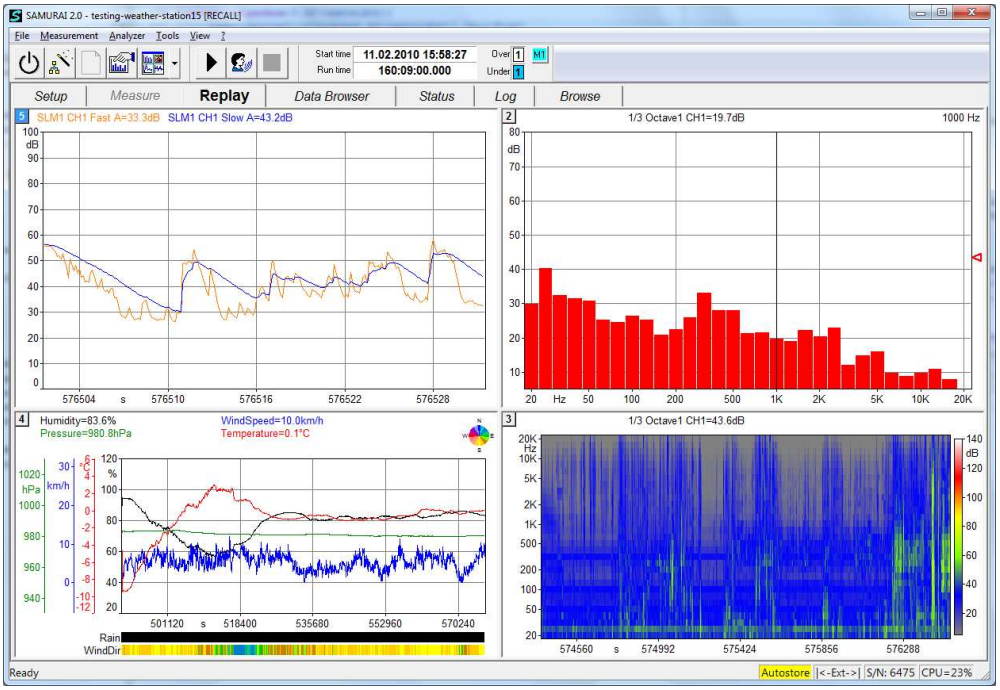

Figure 2.12: Typical realtime representation of Soundbook results (SAMURAI)

Figure 2.13: Soundbook with accessories in carrying case

You may connect the microphones, accelerometers and other transducers at any time, i. e. when Soundbook is running or turned off. When you have powered up the device, connected the transducers, started the measuring software and set the measuring channels, Soundbook is ready for measuring.

NOTICE!	Please note that the installed Windows operating system allows simultaneous use of various applications. However, Windows is no realtime operating system. To rule out any complications during data acquisition we recommend to exit all unnecessary applications before measuring. Some applications may require or even force exiting unnecessary programmes.

2.3 Driver installation

You will find the installation programme on the enclosed CD or on the installation CD of the application software. The driver version is part of the file name (f. e. `SINUS_Driver 5.0.0.0.exe` → driver version: 5.0.0.0). After executing the installation file meassage window opens. Please verify that all Soundbook components are connected to the PC and click on **Ok**. After the welcome window showing the version number and the driver history window the installation procedure starts. Depending on the system performance this procedure may take a few minutes. Click on the button **Finish** to finish installation and exit the program. Having activated the corresponding checkbox, the **SINUS Driver Configuration** will start automatically. Otherwise it may be started via the given path with the start menu.

2.3.1 SINUS Driver Configuration

This tool is used for the configuration of the driver. The settings are described in table 2.1.

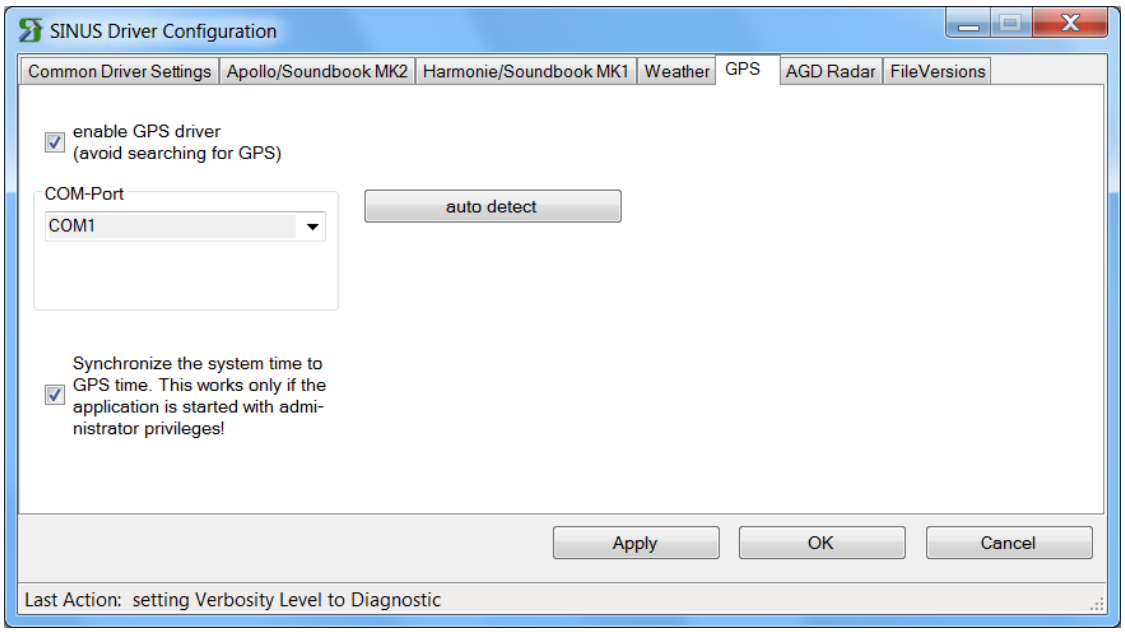

Figure 2.14: SINUS Driver Configuration

Tab	Description
Common Driver Settings	Adjustment of the Verbosity Level. It specifies how much information is written to the log-files. The possible values are described on the right.
Apollo/Soundbook MK2	Information about the detected Apollo/Soundbook MK2 analyzers (Refresh with F5 or via context menu).
Harmonie/Soundbook MK1	Information about the detected Harmonie/Soundbook MK1 analyzers (New Calibration via context menu).
Weather	Activation of the driver for the weather station. Select the type and the used port. The last one may be detected automatically (**autodetect**).
GPS	Aktivation of the driver for GPS devices connected via RS232. Select the used COM port. It may also be detected automatically (**autodetect**). If the measuring software is run as administrator, the GPS time synchronization every minute is available.
AGD Radar	Aktivation of the AGD Radar driver. Select the used port. It may also be detected automatically (**autodetect**).
File Versions	Overview of the installed parts of the driver and its status.

Table 2.1: Functions of the driver configuration tool

3 Technical specifications Soundbook MK2

All technical specifications refer to approved measurement microphones with a sensitivity of 50 mV/Pa.

Technical Specifications	
Scope:	Soundbook (base CF-19 with Windows) and measuring software
Display of measurement results:	TFT display with analogue and digital display (CF-19)
Interface:	RS232, VGA, LAN, modem, PCMCIA, 1 x USB 3.0, 1 x USB 2.0, no feedback[1]
Battery:	Li-ion battery CF-VZSU48U, min. measuring time in battery operation > 3 h
External power supply:	100 . . . 240 VAC with adapter CF-AA1633A, input voltage at the Soundbook MK2 15 V
Number of channels:	2, 4 or 8 measuring channels
Accuracy:	According to IEC 61672-1 class 1, group Z, percentiles according to DIN 45657
1/3 octave filter:	Complying with EN 61260 class 1, 6 pole, elliptical, base 2
Max. drift of the internal time:	max. 1.728 ms in 24 h
Resolution:	24 Bit
Synchronization:	yes
Input channels	
Sampling rates:	200 Hz - 204.8 kHz possible (Basic: 44.1 kHz, 48 kHz, 51.2 kHz) see table 1.1
Gain:	0 dB, -20 dB
Frequency weighting:	A, C, Z simultaneously, see table 3.3
Time weighting:	F (Fast, $\tau = 0.125\ s$), S (Slow, $\tau = 1\ s$), I (Impulse, $\tau_{increase} = 0.035\ s, \tau_{decrease} = 1.5\ s$), peak ($\tau = 20\ \mu s$)
Crosstalk:	< -80 dB
Offset correction:	yes, at automatic calibration
Anti-alias Filter:	22.4 kHz @ 51.2 kHz
Overload display:	yes
Phase shift:	typical: 0.01° at 1 kHz
Input impedance:	1 MΩ
Input coupling:	DC, AC (HP with $f_g = 0.13$ Hz)
Input filter:	adjustable: non, 1 Hz HP, 10 Hz HP, 2000 kHz LP, 1-2000 Hz BP, 10-2000 Hz BP
Transducer supply (per channel):	± 14 V; polarization voltage 20 V, 63 V or 200V; ICP: 2 mA (also 4 mA with Soundbook MK2)
TEDS nach IEEE P1451:	yes
Max. electr. measuring range:	± 10 V_{peak} (+8 % overload backup)
U_{max} at input:	±30 V_{peak}
Inherent noise level (at 0 dB gain):	<6 dB(A), <8 dB(C), <15 dB(Z) (using MV203 and substitute impedance K65), <3 dB(A), <2 dB(C), <5 dB(Z) bei 50 Ω direct at input
Linearity range:	See table 3.2
Impulse range:	> 55 dB
Sampling rate level/1/3 octave values:	5 . . . 125 ms (higher values possible, but without FAST weighting)
Slow input channels	
Quantity:	8 single-ended or 4 differential
Sampling rate:	200 Hz per channel
Input voltage:	± 27.5 V
Input impedance:	100 kΩ
Inputs Trigger/Tacho (2)	
Frequency:	0.1 Hz . . . 6 MHz
Trigger level:	adjustable ± 12.5 V
Trigger outputs	2
Output channels (2)	
Sampling rate:	25.6, 51.2 kHz
Band width:	DC . . . 20 kHz
Max. output voltage:	± 3.7 V_{peak}

[1] avoid ground loops

Attenuation:	0 dB . . . 85 dB in 0.5 dB-steps
Connectors	
Input channels:	see section 2.1
Slow input channels:	see section 2.1
Outputs:	see section 2.1
Dimensions and weights	
Dimensions:	280 mm x 220 mm x 65 mm
Weight:	3100 g
Surrounding conditions	
Temperature:	Deviation of calibration < 0,3 dB within a temperature range of -20 °C to 50 °C at a relative humidity of 65 %. After temperature changes of more than 15 °C allow the analyzer to adjust to the temperature for 30 min.
Humidity:	Deviation of calibration < 0,1 dB within a relative humidity range of 30 to 90 % at a temperature of 40 °C
Magnetic fields:	A field of 80 A/m (50 Hz) results in a display of < 20 dB (A), 45 dB (C) and 45 dB (Z)
Vibration:	Acceleration 1 m/s^2 (frequency 20 Hz . . . 1 kHz): < 0,1 dB @ 50 dB level
Influence of user:	User has no influence if the microphones are set up at a distance of 1.5 m.
Storage conditions:	-20 °C . . . +60 °C, humidity max. 95 %
Shock resistance:	Complying with MIL-STD 810F 516.5
Electro-magnetic compatibility	
Emission:	Complying with EN 61000-6-1 (2007)
Immunity:	Complying with EN 61000-6-2 (2006)
Configuration:	Soundbook with 4 x MK221/MV203 and 1.5 m cable each
Approved accessories (options)	
AC adapter:	CF-AA1633A

Table 3.1:Technical specifications Soundbook MK2

3.1 Linearity ranges

The linearity ranges of sound pressure levels for all measuring ranges and frequency weightings are given in the following. All specifications refer to approved measurement microphones with a sensitivity of 50 mV/Pa.

Range	Weighting	f=31.5 Hz	f=1 kHz	f=4 kHz	f=8 kHz	f=12.5 kHz
1 V	Z	14.5 . . . 118.5 dB	15.5 . . . 118.5 dB	15 . . . 118.5 dB	15 . . . 118.5 dB	15 . . . 118.5 dB
	A	10 . . . 78.5 dB	11.5 . . . 119 dB	12 . . . 119.5 dB	10.5 . . . 117.5 dB	9 . . . 114.5 dB
	C	12.5 . . . 115.5 dB	13.5 . . . 118.5 dB	13 . . . 118 dB	12.5 . . . 115.5 dB	12.5 . . . 112.5 dB
10 V	Z	26.5 . . . 138.5 dB	28.5 . . . 138.5 dB	27.5 . . . 138.5 dB	27.5 . . . 138.5 dB	27.5 . . . 138.5 dB
	A	23.5 . . . 98.5 dB	24.5 . . . 139 dB	24 . . . 139.5 dB	24.5 . . . 137.5 dB	24 . . . 134.5 dB
	C	24 . . . 135.5 dB	25 . . . 138.5 dB	23.5 . . . 138 dB	24 . . . 135.5 dB	23.5 . . . 132.5 dB

Table 3.2: Linearity ranges (typical) for Soundbook MK2 according to frequency weightings Z, A and C

3.2 Frequency weightings

The following table shows the characteristics (filter curve) for the A- and C-weightings according to IEC 60651 / 60804. The last three columns contain the filter curves in Soundbook (measured at a gain of -20 dB).

f in Hz	A acc. to 60651	C acc. to 60651	A	C	Z
10	-70.0	-14.3	-69.52	-14.36	-0.04
12.5	-63.4	-11.2	-63.40	-11.36	-0.03
16	-56.7	-8.5	-56.40	-8.44	-0.01
20	-50.5	-6.2	-50.42	-6.25	-0.03
25	-44.7	-4.4	-44.86	-4.48	-0.04
31.5	-39.4	-3.0	-39.54	-3.04	0.00
40	-34.6	-2.0	-34.55	-1.99	-0.01
50	-30.2	-1.3	-30.29	-1.31	-0.01
63	-26.2	-0.8	-26.23	-0.83	0.00
80	-22.5	-0.5	-22.38	-0.47	0.03
100	-19.1	-0.3	-19.12	-0.28	0.02
125	-16.1	-0.2	-16.19	-0.17	0.01
160	-13.4	-0.1	-13.23	-0.06	0.02
200	-10.9	0	-10.85	-0.03	0.00
250	-8.6	0	-8.69	-0.01	-0.01
315	-6.6	0	-6.63	0.03	0.02
400	-4.8	0	-4.77	0.03	0.01
500	-3.2	0	-3.25	0.03	0.00
630	-1.9	0	-1.91	0.03	0.00
800	-0.8	0	-0.77	0.05	0.03
1.0k	0	0	0.03	0.03	0.03
1.25k	0.6	0	0.58	-0.03	0.00
1.6k	1.0	-0.1	1.01	-0.08	0.01
2.0k	1.2	-0.2	1.20	-0.17	-0.01
2.50k	1.3	-0.3	1.27	-0.3	-0.02
3.15k	1.2	-0.5	1.23	-0.48	0.01
4.0k	1.0	-0.8	1.00	-0.81	0.00
5.0k	0.5	-1.3	0.61	-1.26	-0.01
6.3k	-0.1	-2.0	-0.04	-1.96	0.00
8.0k	-1.1	-3.0	-1.02	-2.98	0.02
10.0k	-2.5	-4.4	-2.36	-4.35	0.02
12.5k	-4.3	-6.2	-4.17	-6.18	0.00
16.0k	-6.6	-8.5	-6.68	-8.69	0.01
20.0k	-9.3	-11.2	-9.25	-11.23	-0.01

Table 3.3: frequency weighting curves IEC 60651/60804 and Soundbook (dB)

4 Declaration of conformity

We, the **SINUS Messtechnik GmbH**, Föpplstraße 13, 04347 Leipzig, Germany, hereby declare that our product

Measuring system Soundbook MK2

Part number.: 90800x
Serial number: #07000

as subject of this **CE** declaration complies with the following standards and further documents:

Technical requirements	Sound level meter:	IEC 61672 (10/2003) class 1
with appropriate software		DIN 45657 (07/1997)
	Third-octave analyzer:	IEC 61260 (09/2001) class 1
	HVMA option:	EN ISO 8041 type 1
		EN ISO 5349
		EN 14253
Electromagnetic compatibility:	Emissions	DIN EN 61000-6-1: 2007
		IEC 61672-1
	Immunity	DIN EN 61000-6-2: 2007
		IEC 61326
		IEC 61672-1
Safety		EN 60950-1

The measuring system is intended for the use with measuring microphones according to IEC 1094-1. The product has been manufactured and tested in compliance with the following internal documents:

Manufacturing and testing documents:	- SINUS Quality assurance manual
	- SINUS Manufacturing documents Soundbook
	- Testing regulations Soundbook

The product has been tested and found to comply with all specifications stated above.

Gunther Papsdorf
Managing Director